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A new fossil species of frog of the Australian limnodynastid genus *Limnodynastes* Fitzinger from the Oligocene Kangaroo Well Local Fauna of the Northern Territory and tabulation of ilial features of all extant and extinct species

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ABSTRACT

A new species of the limnodynastid genus *Limnodynastes* Fitzinger is described from the Oligocene Kangaroo Well Local Fauna on the Deep Well pastoral station in the Northern Territory. The material comprises the proximal portions of a left and right ilium and is named *L. waterhousae*. The new species appears to be most similar to *L. antecessor* Tyler, 1990 from Oligo-Miocene sites at Riversleigh, Queensland. The major characteristics of the ilium of all 30 extant and extinct Australian frog genera are summarised.

KEYWORDS: Anura, Limnodynastidae, *Limnodynastes waterhousae*, ilium, Oligocene, Kangaroo Well Local Fauna, Northern Territory.

INTRODUCTION

The Late Oligocene Kangaroo Well Local Fauna was named by Stirton *et al.* (1968). It comprises a diverse faunal assemblage located on the Deep Well pastoral station, at the extreme north western extremity of the Lake Eyre Basin in the Northern Territory, and is approximately 40 km south of Alice Springs.

Megirian *et al.* (2004) provided an overview of the fauna, named the limestone surrounding the fossils the Ulta Limestone, and interpreted the climatic events during deposition. Amongst the diverse faunal elements, they reported that four species of frogs had been located there. One of these species was identified as the myobatrachid (now limnodynastid) *Limnodynastes* species. The other species are *Australobatrachus ilins* Tyler, 1976, *Australobatrachus* sp. and *Litoria* sp. Here the *Limnodynastes* species is described and compared with congeners. To aid ilial identification the principal features of all extant and extinct genera are tabulated. Terminology of ilial features follows that of Tyler (1976). The specimens are deposited in the Museum and Art Gallery of the Northern Territory (NTM).

SYSTEMATICS

Order Anura Rafinesque, 1815

Family Limnodynastidae Lynch, 1971

Genus *Limnodynastes* Fitzinger, 1843

Generic Definition: When the ilial characteristics were first defined by Tyler (1976), the genus included *L. ornatus* (Gray, 1842) and the closely related *L. spenceri* (Parker, 1940). These two species differed from all of the congeners examined in possessing a distinct dorsal crest and in having a moderately formed dorsal acetabular expansion, compared with a high and acutely pointed spike in congeners. Frost *et al.* (2006) removed these two species from *Limnodynastes* and resurrected *Opisthodon* Steindachner, 1867 for them. However, *Platyplectrum* Günther, 1863 takes priority, as noted by Tyler & Doughty (2009). As a consequence of the separation of *ornatum* and *spenceri,* the ilial definition of *Limnodynastes* must be modified:

The ilial shaft is slightly curved and bears a medial groove. The acetabulum is of variable size and bisected by the ventral margin of the ilial shaft. The ventral acetabular expansion is small and narrow. The dorsal acetabular expansion rises into a high and acutely pointed spike. The dorsal prominence is conspicuous and broad and rounded. The dorsal protuberance is level with or anterior to the anterior rim of the acetabulum.

Features of the ilia of all extant and extinct genera found in Australia are listed in Table 1.

Limnodynastes waterhousae sp. nov.

(Fig. 1)

Type material. HOLOTYPE (Fig. 1A) – NTM P.2692-14, proximal portion of a left ilium from Kangaroo Well, Deep Well pastoral station, Northern Territory, Australia (24°13.417'S, 134°12.717'E), 7 August 2002, D. Megirian. PARATYPE (Fig. 1B) – NTM P2780-11, fragment of the proximal portion of a right ilium, same data as holotype.

Description (based on holotype). The dorsal acetabular expansion is large, tapering and inclined at approximately 45° to ilial shaft (Fig. 1A). A distinct depression approximately

Table 1. Features of ilia of Australian frog genera. Data derived from Tyler (1976 and pers. obs.) except for *Etnabatrachus* and *Spicospina* which are derived from Hocknull (2005) and Roberts *et al.* (1997), respectively.

Genus	Ilial Shaft Crest	Ilial Shaft Rim	Dorsal Protuberance	Dorsal Prominence / Anterior Rim of Acetabulum
Adelotus	absent	present	prominent	anterior
Arenophryne	absent	absent	absent	level
Assa	absent	absent	inconspicuous	level
Australobatrachus	absent	absent	inconspicuous	anterior
Austrochaperina	absent	absent	inconspicuous	posterior
Cophixalus	absent	absent	inconspicuous	anterior
Crinia	absent	present or absent	moderate or inconspicuous	anterior
Cyclorana	absent	present or absent	inconspicuous	anterior
Etnabatrachus	absent	absent	inconspicuous	posterior
Geocrinia	absent	absent	absent	level
Heleioporus	absent	absent	prominent	anterior
Hylophorbus	absent	absent	prominent	posterior
Lechriodus	present	absent	moderate	posterior
Limnodynastes	absent	absent	prominent	anterior or level
Litoria	absent	present or absent	moderate	usually anterior
Metacrinia	absent	absent	absent	level
Mixophyes	present	absent	inconspicuous	anterior
Myobatrachus	absent	absent	absent	posterior
Neobatrachus	absent	absent	prominent	anterior
Notaden	absent	absent	prominent	posterior
Nyctimystes	absent	absent	moderate	level
Paracrinia	absent	absent	prominent	anterior
Philoria	absent	present	prominent or inconspicuous	anterior
Platyplectrum	absent	present	inconspicuous	posterior
Pseudophryne	absent	absent	moderate	level
Rana	present	absent	inconspicuous	posterior
Rheobatrachus	absent	absent	prominent	posterior
Spicospina	absent	absent	inconspicuous	anterior
Taudactylus	absent	absent	prominent	anterior
Uperoleia	absent	absent	prominent	anterior

0.7 mm in length is located on the superior margin of the shaft directly above the anterior portion of the acetabulum. A conspicuous foramen is located anterior to this depression. The acetabular fossa is very large and shallow and lacks a detectable rim. The preacetabular expansion is very narrow and poorly developed and the dorsal protuberance is laterally disposed and very small. The distance from the tip of the dorsal acetabular expansion to the inferior termination of the ilial shaft is 4.6 mm. The length along the mid-section of the shaft is 3.02 mm.

Structurally the paratype differs in that it is partially less complete and slightly smaller than the holotype. The majority of the dorsal acetabular expansion is missing as is the preacetabular zone. However, the ventral acetabular expansion is more extensive than in the holotype, with a depth equivalent to two-thirds of the acetabular fossa. The maximum dimension of the paratype is 4.2 mm.

Comparison with other species. Although almost all of the ilial shaft is missing in both specimens, the proximal portion of the ilium displays sufficient features to permit adequate comparison with other Oligocene taxa. The most similar is *Limnodynastes antecessor* Tyler, 1990, which is abundant at numerous sites of Oligo-Miocene age at Riversleigh in northwest Queensland, approximately 400 km northeast of Kangaroo Well. *Limnodynastes waterhousae* is distinguished by its more acute dorsal acetabular expansion, less prominent dorsal prominence, less developed acetabular rim and narrower preacetabular zone.

There is a slight resemblance between *L. waterhousae* and the extant *L. peronii* (Duméril & Bibron, 1841), which is also known from the Mid-Pleistocene of New South Wales (Tyler *et al.* 1998) and from the late Caenozoic of central Queensland (Hocknull 2005). The latter species differs in having a shorter dorsal acetabular expansion, and its inclination to the tibial shaft is more obtuse.

Limnodynastes archeri Tyler, 1982 was described from the Oligocene Etadunna Formation of South Australia, but it resembles *P. ornatum* very closely and it is now evident that it should be referred to *Platyplectrum*.

Etymology. Named for Lyn Waterhouse of the Microscopy Unit at the University of Adelaide, to whom the author is indebted for the SEM figures of the frog ilium

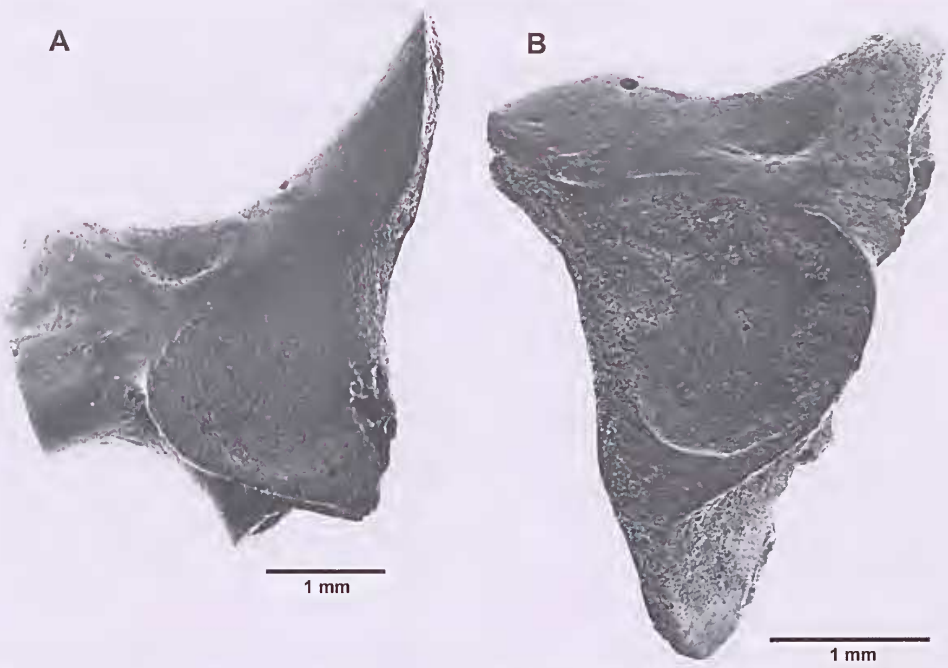

Fig. 1. SEM photographs of type material of *Limnodynastes waterhousae* sp. nov.: **A**, holotype (NTM P.2692-14), proximal portion of left ilium; **B**, paratype (NTM P.2780-11), proximal portion of right ilium.

in this paper and numerous other figures that have been published elsewhere.

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